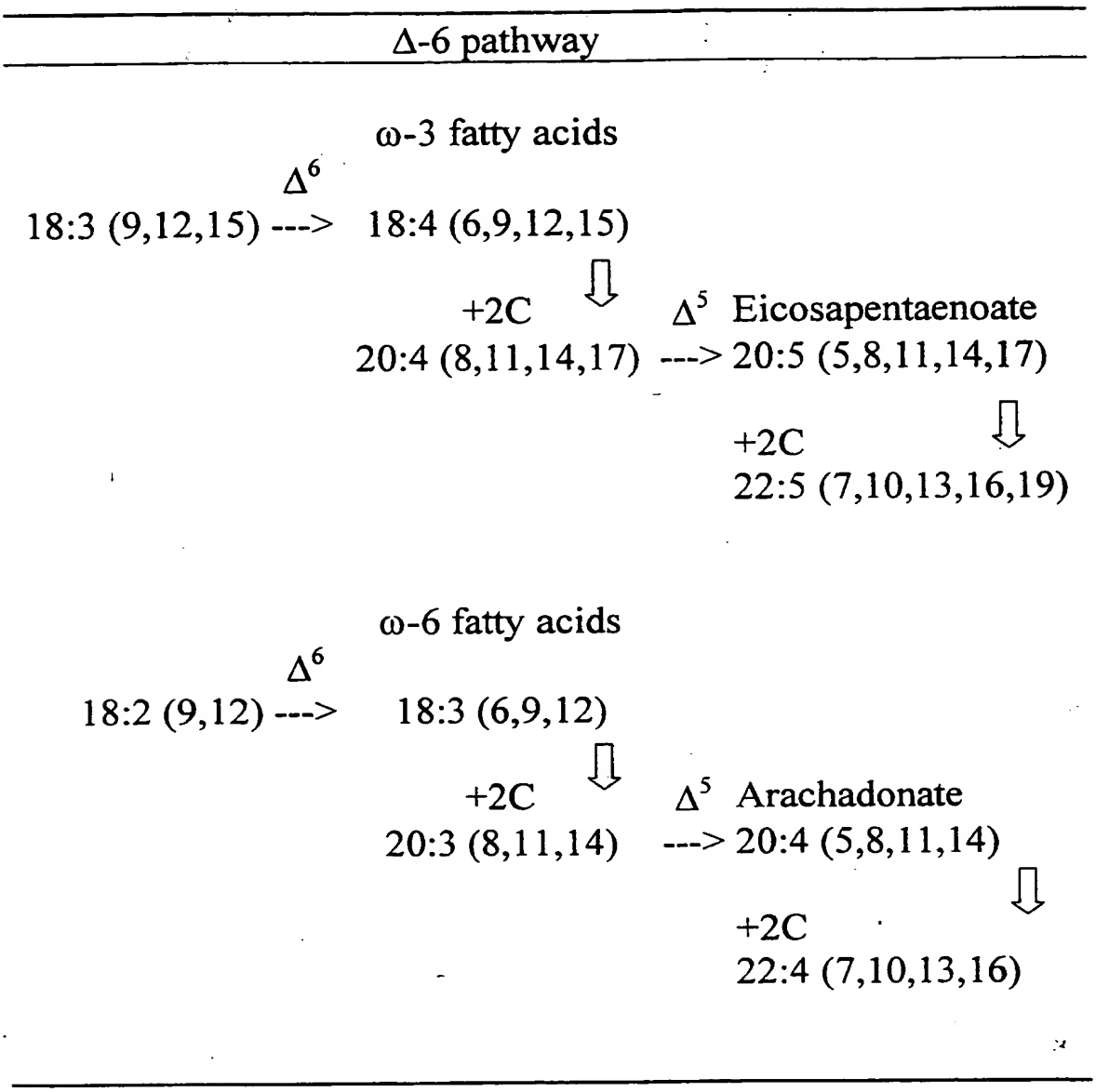
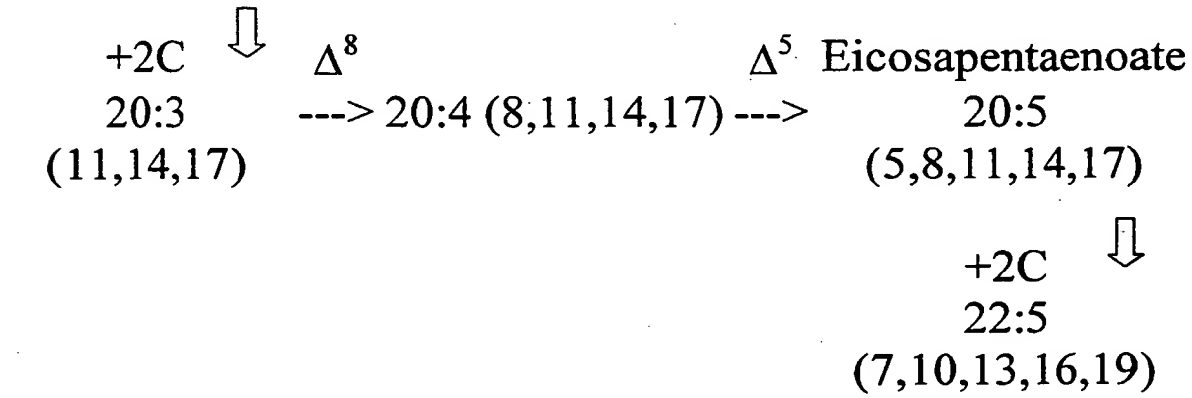

Δ-6 pathway
ω-3 fatty acids
Δ6
18:3 (9,12,15) ---> 18:4 (6,9,12,15)
+2C
20:4 (8,11,14,17)
Δ5 Eicosapentaenoate
---> 20:5 (5,8,11,14,17)
+2C
22:5 (7,10,13,16,19)
ω-6 fatty acids
Δ6
18:2 (9,12) ---> 18:3 (6,9,12)
+2C
20:3 (8,11,14)
Δ5 Arachadonate
---> 20:4 (5,8,11,14)
+2C
22:4 (7,10,13,16)

FIG. 1A

Δ-8
pathway

ω-3 fatty acids



ω-fatty acids

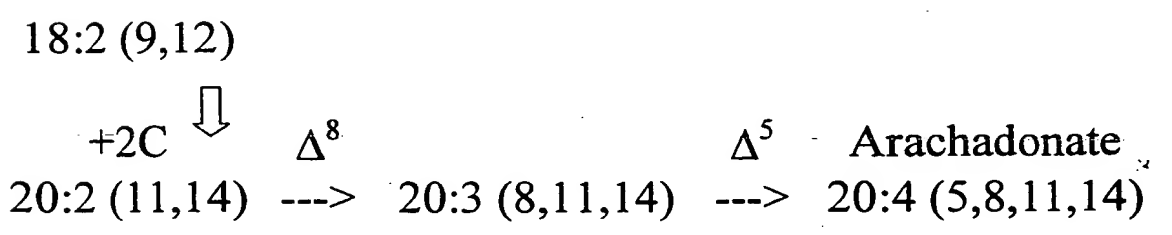
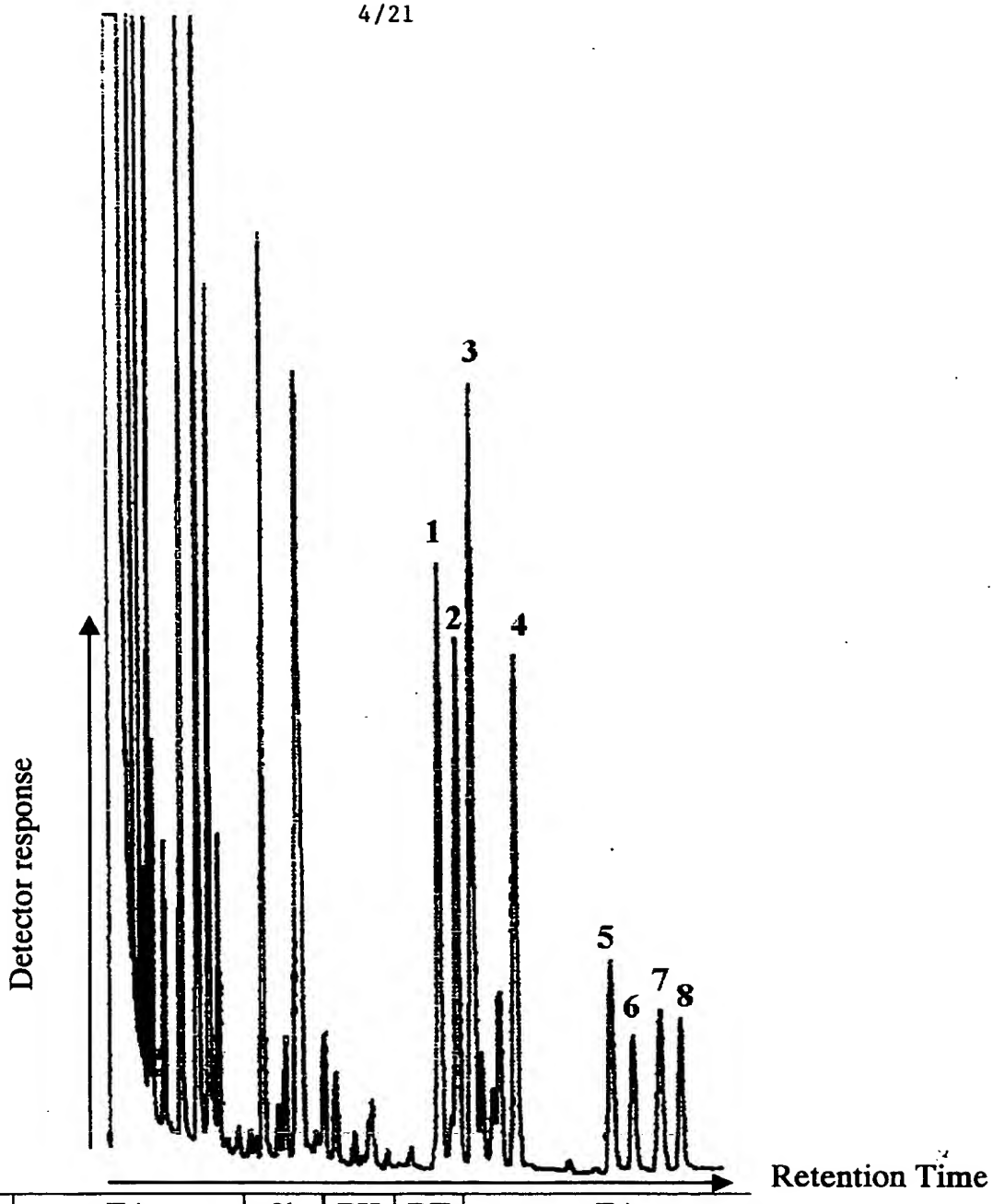


FIG. 1B

20:3 Δ11,14,17
+2C
n-3 fatty acids
Δ8
20:4 Δ8,11,14,17
Δ5
20:5 Δ5,8,11,14,17
Eicosapentaenoate
18:3 Δ9,12,15
Δ6
18:4 Δ6,9,12,15
+2C
20:2 Δ11,14
+2C
n-6 fatty acids
Δ8
20:3 Δ8,11,14
Δ5
20:4 Δ5,8,11,14
Arachidonate
18:2 Δ9,12
Δ6
18:3 Δ6,9,12
+2C

FIG. 1C



PK	RT	FA	%	PK	RT	FA	
1	10.0	20:2 Δ11,14	7.2	4	11.7	20:5 Δ5,8,11,14,17	6.2
2	10.3	20.3 Δ8,11,14	6.3	5	14.0	22:4 Δ7,10,13,16	2.9
3	10.7	20:4 Δ5,8,11,14	9.0	6	14.5	22:5 Δ4,7,10,13,16	1.8
	10.9	20:3 Δ11,14,17	1.4	7	15.2	22:5 Δ7,10,13,16,19	2.6
				8	15.7	22:6 Δ4,7,10,13,16,19	2.0

FIG. 2

```
fat-4    1 MVLREQEHEPFFIKIDGKWCQIDDAVLRSHPGGS.AITTYKNMDATTVFHTFHTGSKEAY
egd1     1 MKSKRQALSPLQLM...EQTYDVSAWVNFHPGGAEIIENYQGRDATDAFMVMH..FQEAF
fat-3    1 MVV.DKNASGLRMKVDGKWLYLSEELVKKHPGGA.VIEQYRNSDATHIFHAFHEGSSQAY
                              W          HPGG        G     F   H
                                    Cytochrome b5-like domain

fat-4   60 QWLTELKKECPTQEPEIPDIKDDPIKGIDDVNMGTENISEKRSAQINKSFTDLRMRVRAE
egd1    56 DKLKRMPK......................INPSFELPPQAAVNEAQEDFRKLREELIAT
fat-3   59 KQLDLLKKH..GEHDEFLEKQLEKRLDKVDINVSAYDVSVAQEKKMVESFEKLRQKLHDD

fat-4  120 GLMDGSPLFYIRKILETIFTILFAFYLQ.YHTYYLPSAILMGVAWQQLGWLIHEFAHHQL
egd1    94 GMFDASPLWYSYKISTTLGLGVLGYFLMVQYQMYFIGAVLLGMHYQQMGWLSHDICHHQT
fat-3  117 GLMKANETYFLFKAISTLSIMAFAFYLQ.YLGWYITSACLLALAWQQFGWLTHEFCHQQP
                                                             HXXXHH

fat-4  179 FKNRYYNDLASYFVGNFLQGFSSGGWKEQHNVHHAATNVVGRDGDLDLVPFYATVAEHLN
egd1   154 FKNRNWNNLVGLVFGNGLQGFSVTCWKDRHNAHHSATNVQGHDPDIDNLPPLAWSEDDVT
fat-3  176 TKNRPLNDTISLFFGNFLQGFSRDWWKDKHNTHHAATNVIDHDGDIDLAPLFAFIPGDLC
                                         HXXHH

fat-4  239 NY..SQDSWVMTLFRWQHVHWTFMLPFLRLSWLLQSIIFVSQMPTHYYDYYRNTAIYEQV
egd1   214 RASPISRK....LIQFQQYYFLVICILLRFIWCFQCVLTVRSLKDRDNQFYRSQYKKEAI
fat-3  236 KYKASFEKAILKIVPYQHLYFTAMLPMLRFSWTGQSVQWVFKENQMEYKVYQRNAFWEQA

fat-4  297 GLSLHWAW.SLGQLYFLPDWSTRIMFFLVSHLVGGFLLSHVVTFNHYSVEKFALSSNIMS
egd1   270 GLALHWTLKALFHLFFMPSILTSLLVFFVSELVGGFGIAIVVFMNHYPLEKIGDPVWDGH
fat-3  296 TIVGHWAW.VFYQLFLLPTWPLRVAYFIISQMGGGLLIAHVVTFNHNSVDKYPANSRILN

fat-4  356 NYACLQIMTTRNMRPGRFIDWLWGGLNYQIEHHLFPTMPRHNLNTVMPLVKEFAAANGLP
egd1   330 GFSVGQIHETMNIRRCIITDWFFGGLNYQIEHHLWPTLPRHNLTAVSYQVEQLCQKHNLP
fat-3  355 NFAALQILTTRNMTPSPFIDWLWGGLNYQIEHHLFPTMPRCNLNACMKYVKEWCKENNLP
                                        HXXHH

fat-4  416 YMVDDYFTGEWLEIEQFRNIANVAAKLTK.KIA
egd1   390 YRNPLPHEGLVILLRYLAVFARMAEKQPAGKAL
fat-3  415 YLVDDYFDGYAMNLQQLKNMAE...HIQA.KAA
```

FIG. 3

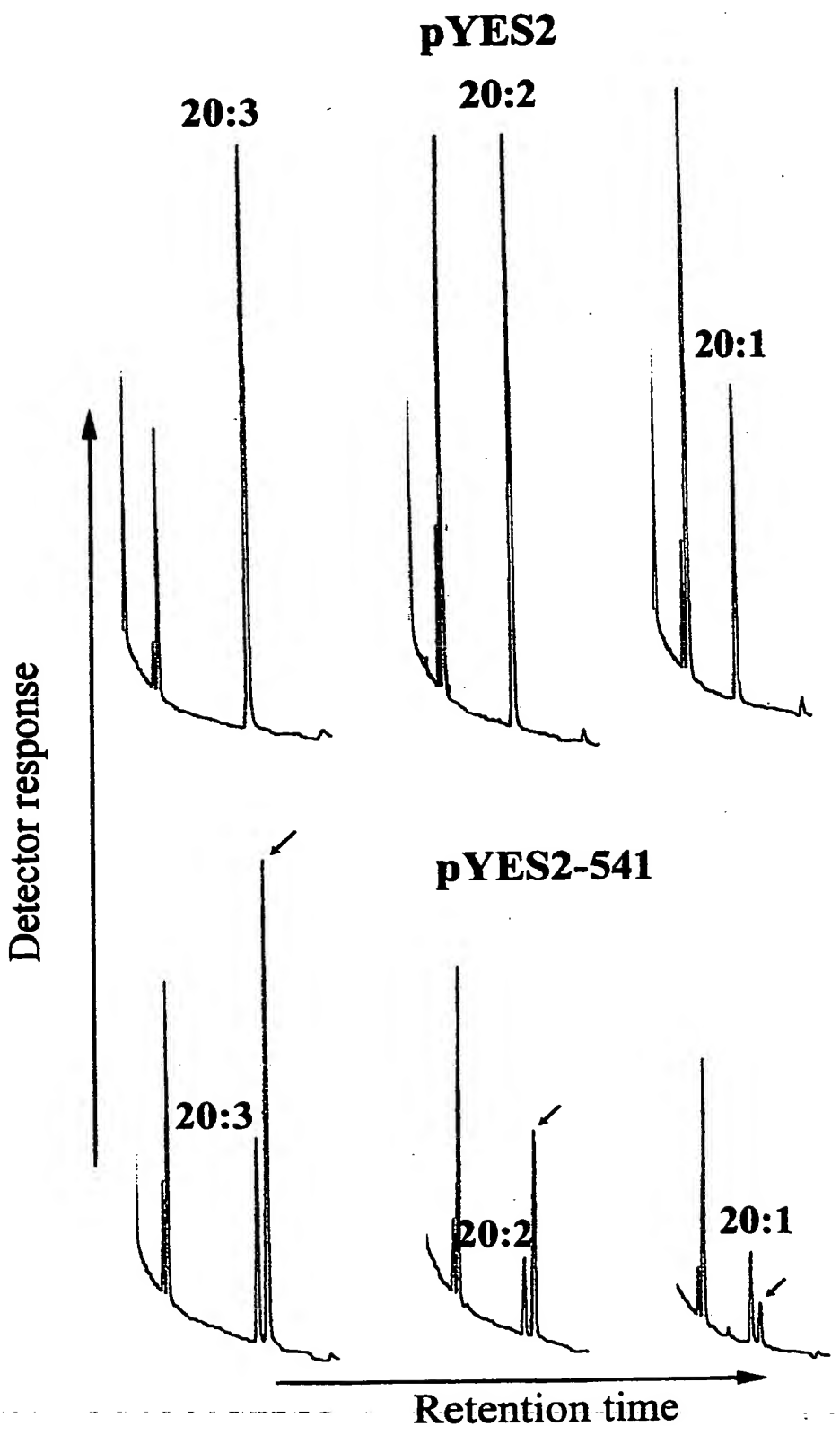

pYES2
20:3
20:2
20:1
pYES2-541
20:3
20:2
20:1
Detector response
Retention time

FIG. 4

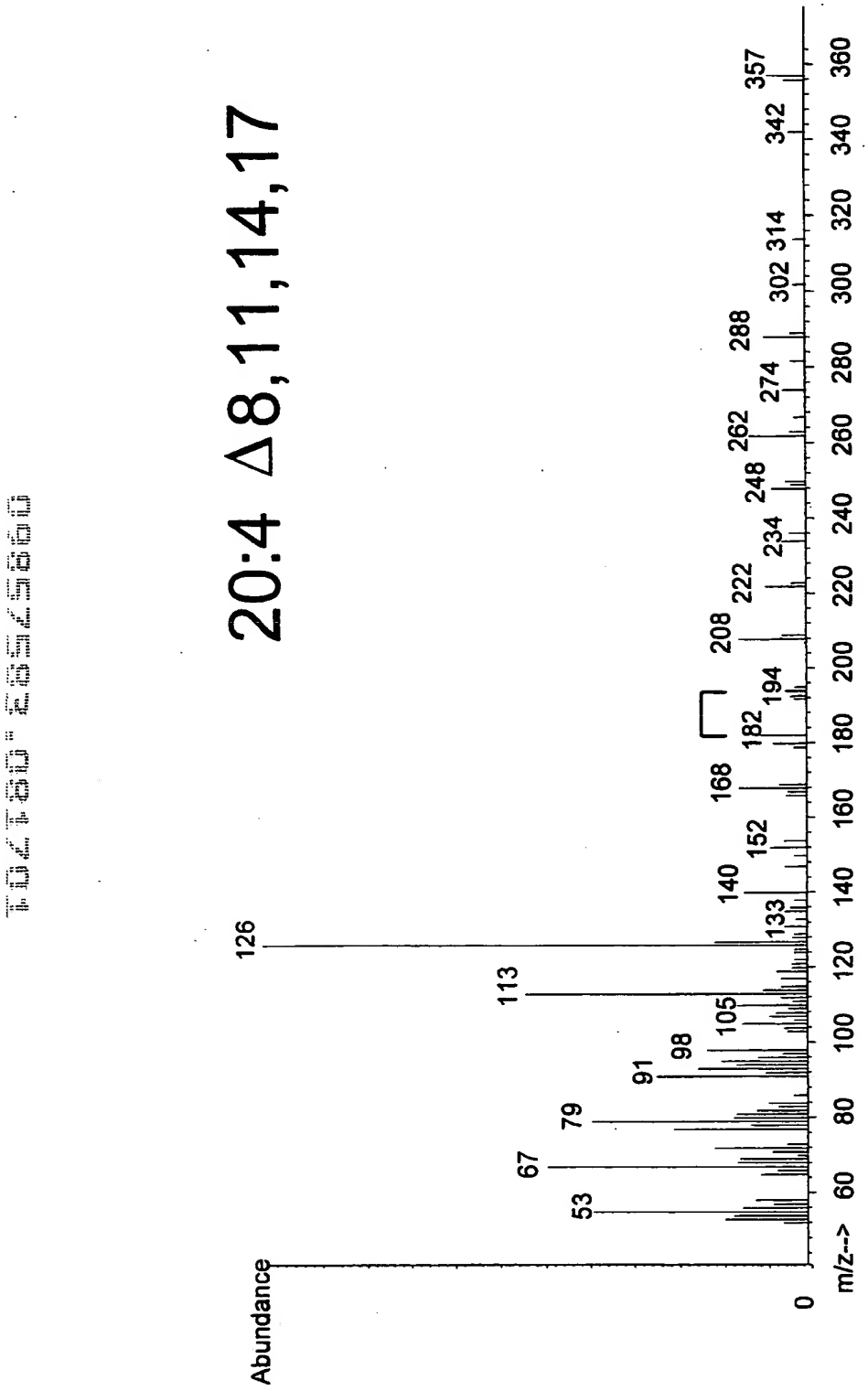

20:4 Δ8,11,14,17
Abundance
m/z-->
0
53
67
79
91
98
105
113
126
133
140
152
168
182
194
208
222
234
248
262
274
288
302
314
342
357
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360

FIG. 5A

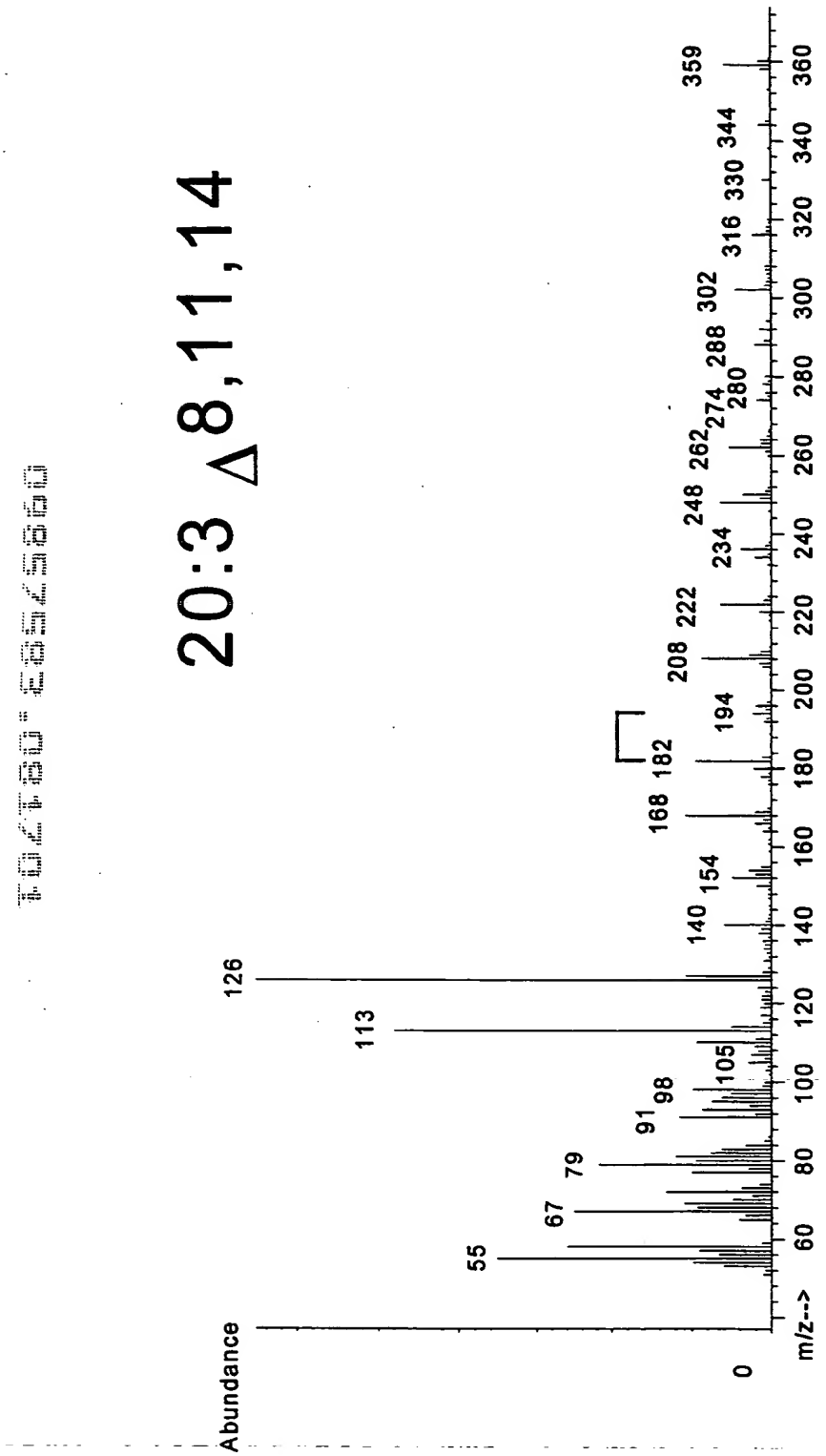

20:3 Δ8,11,14
Abundance
m/z-->
0
55
67
79
91
98
105
113
126
140
154
168
182
194
208
222
234
248
262
274
280
288
302
316
330
344
359
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360

FIG. 5B

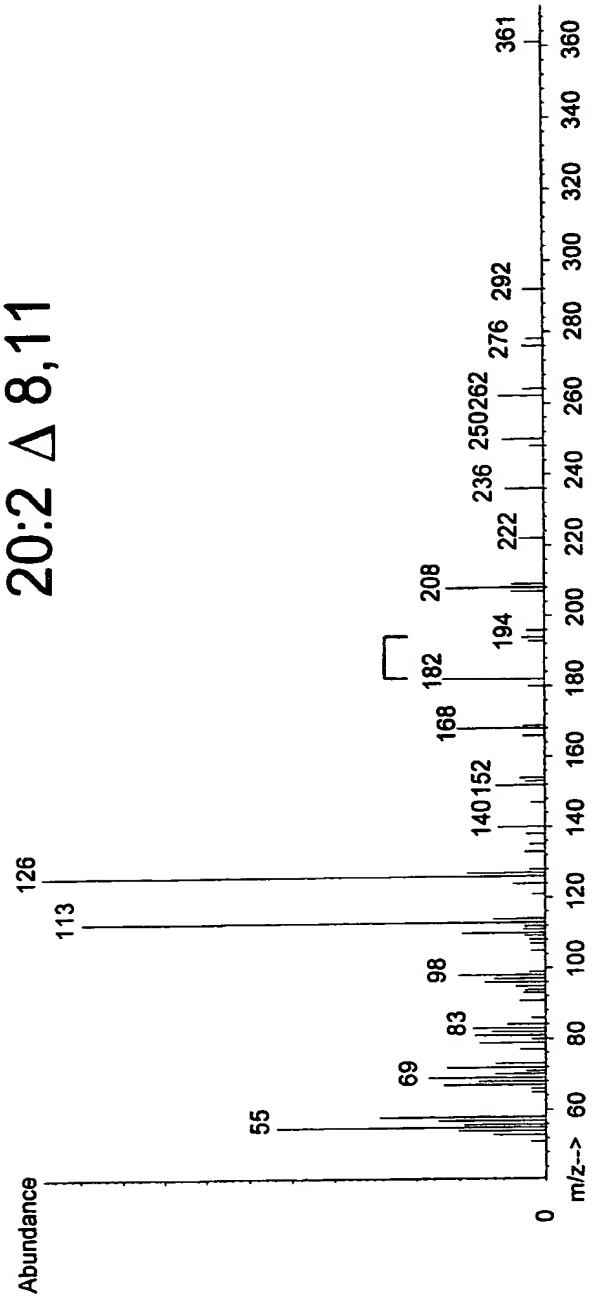

20:2 Δ 8,11
Abundance
m/z-->
0
55
69
83
98
113
126
140
152
168
182
194
208
222
236
250
262
276
292
300
320
340
360
361

FIG. 5C

1	MVLREQEHEP	FFIKIDGKWC	QIDDAVLRSH	PGGSAITTYK	NMDATTVFHT
51	FHTGSKEAYQ	WLTELKKECP	TQEPEIPDIK	DDPIKGIDDV	NMGTFNISEK
101	RSAQINKSFT	DLRMRVRAEG	LMDGSPLFYI	RKILETIFTI	LFAFYLQYHT
151	YYLPSAILMG	VAWQQLGWLI	HEFAHHQLFK	NRYYNDLASY	FVGNFLQGFS
201	SGGWKEQHNV	HHAATNVVGR	DGDLDLVPFY	ATVAEHLNNY	SQDSWVMTLF
251	RWQHVHWTFM	LPFLRLSWLL	QSIIFVSQMP	THYYDYYRNT	AIYEQVGLSL
301	HWAWSLGQLY	FLPDWSTKIM	FFLVSHLVGG	FLLSHVVTFN	HYSVEKFALS
351	SNIMSNYACL	QIMTTRNMRP	GRFIDWLWGG	LNYQIEHHLF	PTMPRHNLNT
401	VMPLVKEFAA	ANGLPYMVDD	YFTGFWLEIE	QFRNIANVAA	KLTKKIA

FIG. 6A

```
   1  GAATTTTCAA TCCTCCTTGG GTCCCACCGC TGTGATATCA AAATGGTATT
  51  ACGAGAGCAA GAGCATGAGC CATTCTTCAT TAAAATTGAT GGAAAATGGT
 101  GTCAAATTGA CGATGCTGTC CTGAGATCAC ATCCAGGTGG TAGTGCAATT
 151  ACTACCTATA AAAATATGGA TGCCACTACC GTATTCCACA CATTCCATAC
 201  TGGTTCTAAA GAAGCGTATC AATGGCTGAC AGAATTGAAA AAAGAGTGCC
 251  CTACACAAGA ACCAGAGATC CCAGATATTA AGGATGACCC AATCAAAGGA
 301  ATTGATGATG TGAACATGGG AACTTTCAAT ATTTCTGAGA AACGATCTGC
 351  CCAAATAAAT AAAAGTTTCA CTGATCTACG TATGCGAGTT CGTGCAGAAG
 401  GACTTATGGA TGGATCTCCT TTGTTCTACA TTAGAAAAAT TCTTGAAACA
 451  AtCTTCACAA TTCTTTTTGC ATTCTACCTT CAATACCACA CATATTATCT
 501  TCCATCAGCT ATTCTAATGG GAGTTGCGTG GCAACAATTG GGATGGTTAA
 551  TCCATGAATT CGCACATCAT CAGTTGTTCA AAAACAGATA CTACAATGAT
 601  TTGGCCAGCT ATTTCGTTGG AAACTTTTTA CAAGGATTCT CATCTGGTGG
 651  TTGGAAAGAG CAGCACAATG TGCATCACGC AGCCACAAAT GTTGTTGGAC
 701  GAgACGGAGA TCTTGATTTA GTCCCATTCT ATGCTACAGT GGCAGAACAT
 751  CTCAACAATT ATTCTCAGGA TTCATGGGTT ATGACTCTAT TCAGATGGCA
 801  ACATGTTCAT TGGACATTCA TGTTACCATT CCTCCGTCTC TCGTGGCTTC
 851  TTCAGTCAAT CATTTTTGTT AGTCAGATGC CAACTCATTA TTATGACTAT
 901  TACAGAAATA CTGCGATTTA TGAACAGGTT GGTCTCTCTT TGCACTGGGC
 951  TTGGTCATTG GGTCaATTGT ATTTCCTACC CGATTGGTCA ACTAAAATAA
1001  TGTTCTTCCT TGTTTCTCAT CTTGTTGGAG GTTTCCTGCT CTCTCATGTA
1051  GTTACTTTCA ATCATTATTC AGTGGAGAAG TTTGCATTGA GCTCGAACAT
1101  CATGTCAAAT TACGCTTGTC TTCAAATCAT GACCACAAGA AATATGAGAC
1151  CTGGAAGATT CATTGACTGG CTTTGGGGAG GTCTTAACTA TCAGATTGAG
1201  CACCATCTTT TCCCAACGAT GCCACGACAC AACTTGAACA CTGTTATGCC
1251  ACTTGTTAAG GAGTTTGCAG CAGCAAATGG TTTACCATAC ATGGTCGACG
1301  ATTATTTCAC AGGATTCTGG CTTGAAATTG AGCAATTCCG AAATATTGCA
1351  AATGTTGCTG CTAAATTGAC TAAAAAGATT GCCTAGATTA CGATTAATTA
1401  ATCAATTTAT TTTCATGTTC TATTCGTGTG TTTTAATATT TTCCAAATTT
1451  TTACCTATTC C
```

FIG. 6B

```
  1  MKSKRQALSP LQLMEQTYDV SAWVNFHPGG AEIIENYQGR DATDAFMVMH
 51  FQEAFDKLKR MPKINPSFEL PPQAAVNEAQ EDFRKLREEL IATGMFDASP
101  LWYSYKISTT LGLGVLGYFL MVQYQMYFIG AVLLGMHYQQ MGWLSHDICH
151  HQTFKNRNWN NLVGLVFGNG LQGFSVTCWK DRHNAHHSAT NVQGHDPDID
201  NLPPLAWSED DVTRASPISR KLIQFQQYYF LVICILLRFI WCFQCVLTVR
251  SLKDRDNQFY RSQYKKEAIG LALHWTLKAL FHLFFMPSIL TSLLVFFVSE
301  LVGGFGIAIV VFMNHYPLEK IGDPVWDGHG FSVGQIHETM NIRRGIITDW
351  FFGGLNYQIE HHLWPTLPRH NLTAVSYQVE QLCQKHNLPY RNPLPHEGLV
401  ILLRYLAVFA RMAEKQPAGK AL
```

FIG. 7A

```
   1  ATTTTTTTTC GAAATGAAGT CAAAGCGCCA AGCGCTATCC CCCTTACAAT
  51  TGATGGAACA AACATATGAT GTGGTCAATT TCCACCCTGG TGGTGCGGAA
 101  ATTATAGAGA ATTACCAAGG AAGGGATGCC ACTGATGCCT TCATGGTTAT
 151  GCACTTTCAA GAAGCCTTCG ACAAGCTCAA GCGCATGCCC AAAATCAATC
 201  CCAGTTTTGA GTTGCCACCC CAGGCTGCAG TGAATGAAGC TCAAGAGGAT
 251  TTCCGGAAGC TCCGAGAAGA GTTGATCGCA ACTGGCATGT TTGATGCCTC
 301  CCCCCTCTGG TACTCATACA AAATCAGCAC CACACTGGGC CTTGGAGTGC
 351  TGGGTTATTT CCTGATGGTT CAGTATCAGA TGTATTTCAT TGGGGCAGTG
 401  TTGCTTGGGA TGCACTATCA ACAGATGGGC TGGCTTTCTC ATGACATTTG
 451  CCACCACCAG ACTTTCAAGA ACCGGAACTG GAACAACCTC GTGGGACTGG
 501  TATTTGGCAA TGGTCTGCAA GGTTTTTCCG TGACATGTTG GAAGGACAGA
 551  CACAATGCAC ATCATTCGGC AACCAATGTT CAAGGGCACG ACCCTGATAT
 601  TGACAACCTC CCCCCCTTAG CCTGGTCTGA GGATGACGTC ACACGGGCGT
 651  CACCGATTTC CCGCAAGCTC ATTCAGTTCC AGCAGTACTA TTTCTTGGTC
 701  ATCTGTATCT TGTTGCGGTT CATTTGGTGT TTCCAGTGCG TGTTGACCGT
 751  GCGCAGTTTG AAGGACAGAG ATAACCAATT CTATCGCTCT CAGTATAAGA
 801  AGGAGGCCAT TGGCCTCGCC CTGCACTGGA CCTTGAAGGC CCTGTTCCAC
 851  TTATTCTTTA TGCCCAGCAT CCTCACATCG CTGTTGGTGT TTTTCGTTTC
 901  GGAGCTGGTT GGCGGCTTCG GCATTGCGAT CGTGGTGTTC ATGAACCACT
 951  ACCCACTGGA GAAGATCGGG GACCCAGTCT GGGATGGCCA TGGATTCTCG
1001  GTTGGCCAGA TCCATGAGAC CATGAACATT CGGCGAGGGA TTATCACAGA
1051  TTGGTTTTTC GGAGGCTTGA ATTACCAGAT TGAGCACCAT TTGTGGCCGA
1101  CCCTCCCTCG CCACAACCTG ACAGCGGTTA GCTACCAGGT GGAACAGCTG
1151  TGCCAGAAGC ACAACCTGCC GTATCGGAAC CCGCTGCCCC ATGAAGGGTT
1201  GGTCATCCTG CTGCGCTATC TGGCGGTGTT CGCCCGGATG GCGGAGAAGC
1251  AACCCGCGGG GAAGGCTCTA TAAGG
```

FIG. 7B

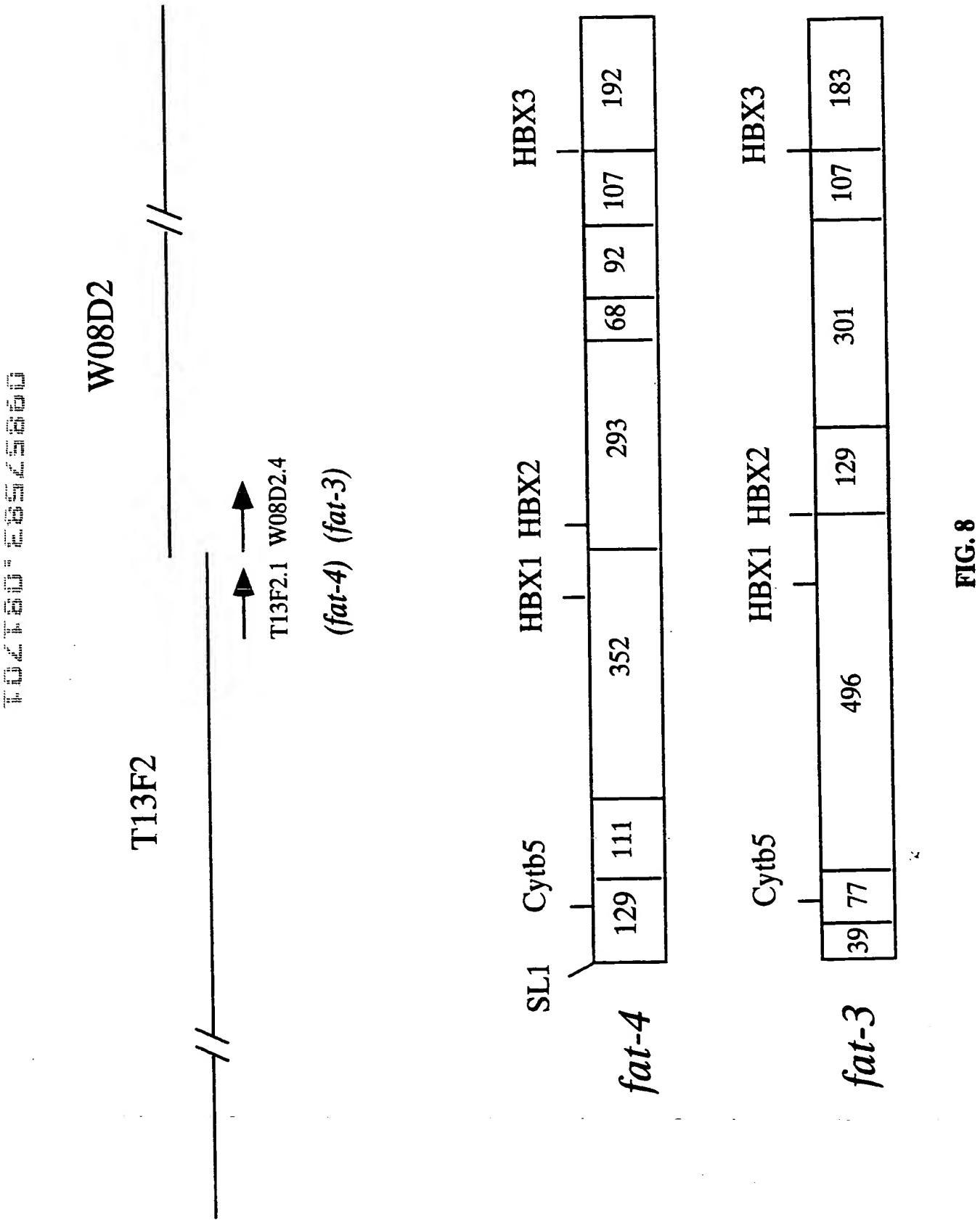

W08D2
T13F2
T13F2.1 W08D2.4
(fat-4) (fat-3)
SL1
Cytb5
HBX1
HBX2
HBX3
129
111
352
293
68
92
107
192
fat-4
Cytb5
HBX1
HBX2
HBX3
39
77
496
129
301
107
183
fat-3

FIG. 8

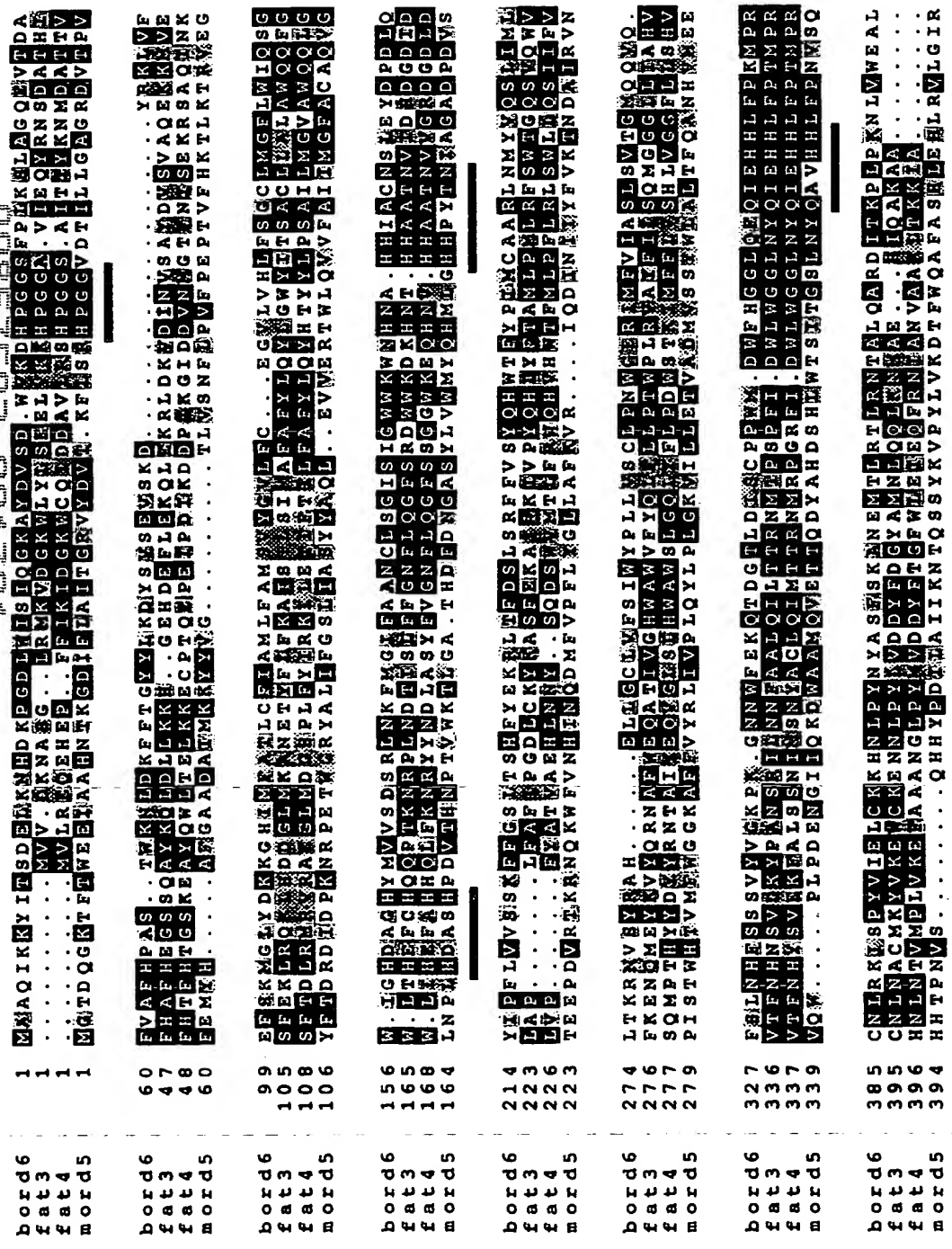


FIG. 9

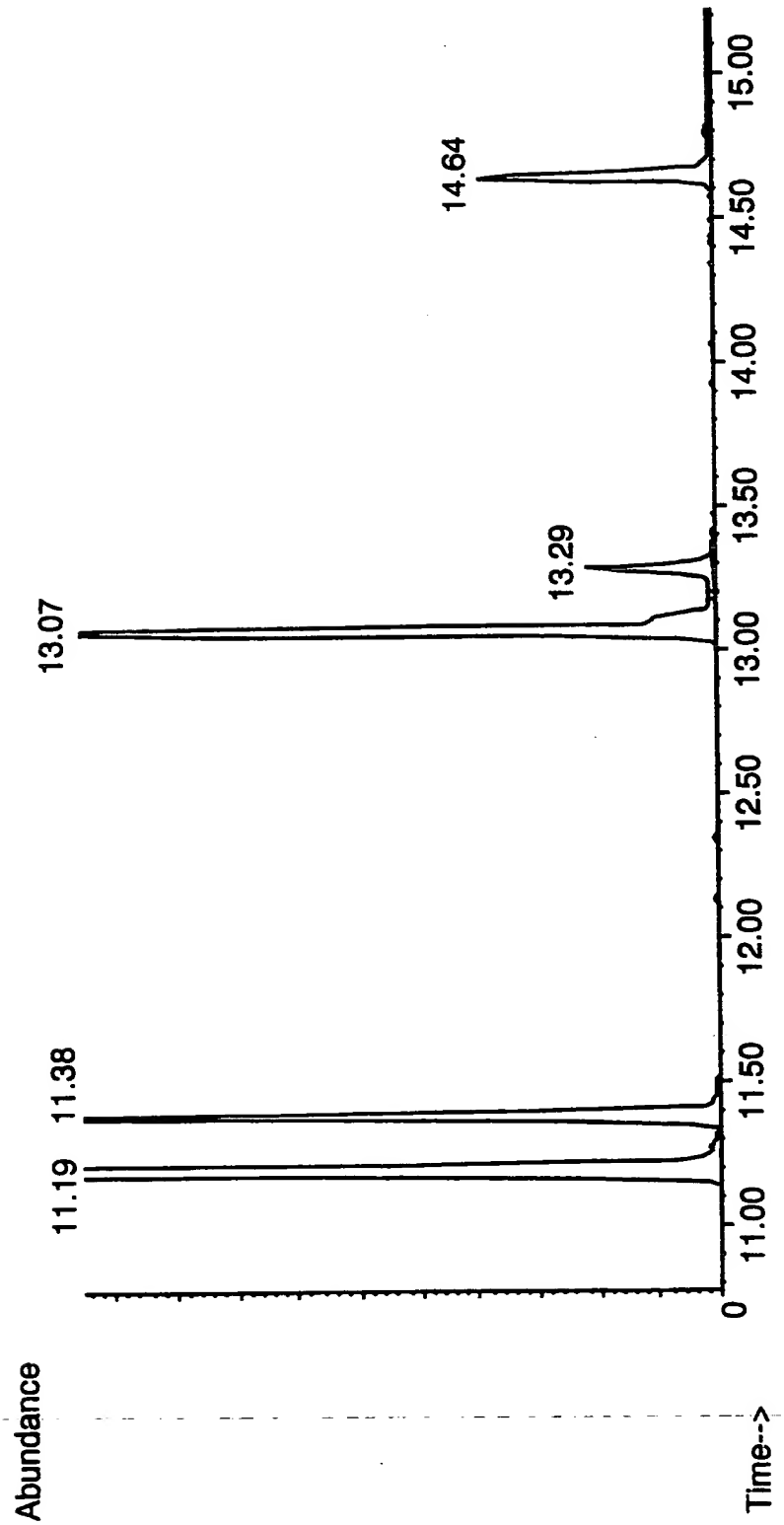

Abundance
Time-->
0
11.00
11.50
12.00
12.50
13.00
13.50
14.00
14.50
15.00
11.19
11.38
13.07
13.29
14.64

FIG. 10A

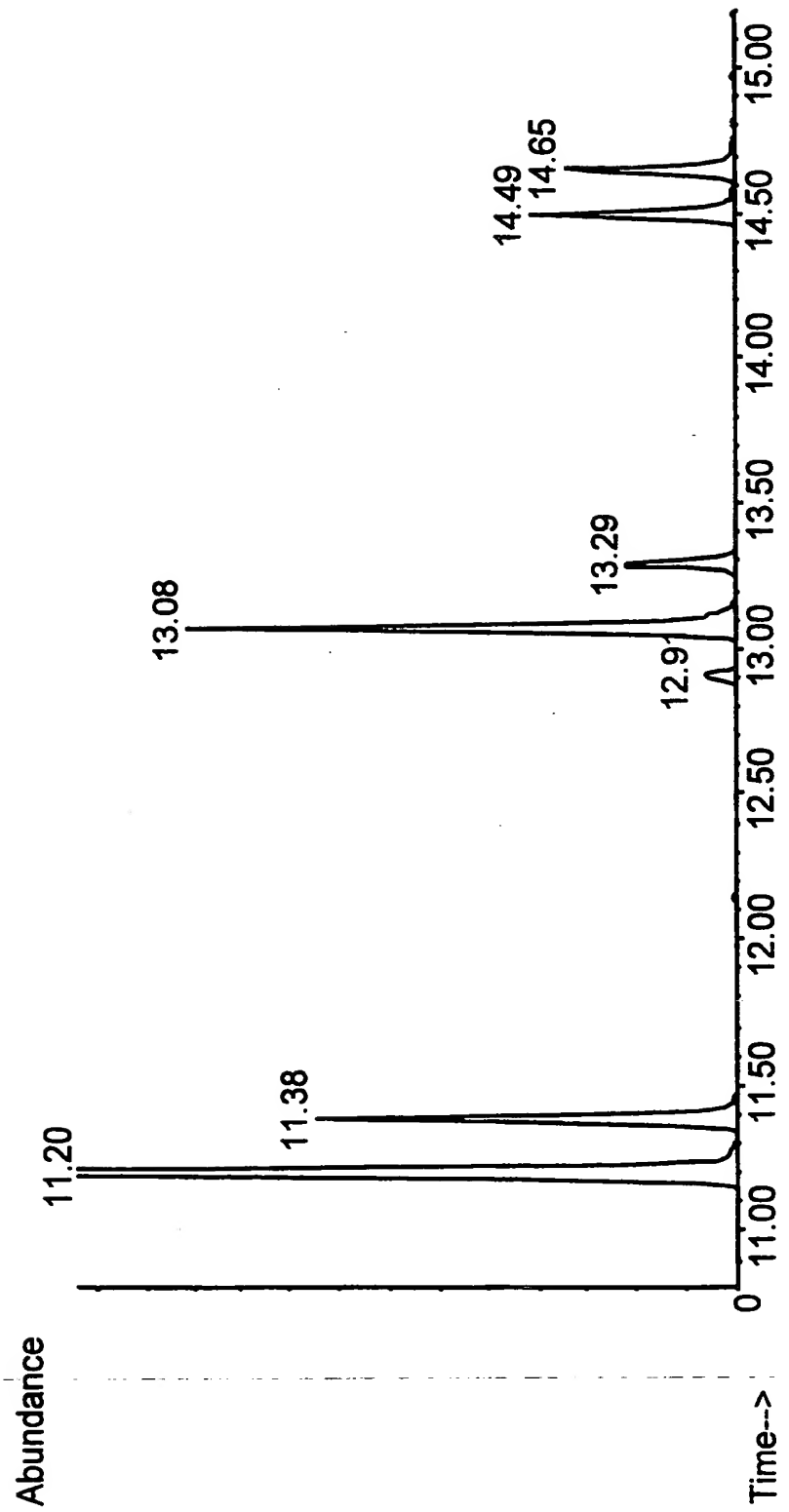

Abundance
Time-->
0
11.00
11.50
12.00
12.50
13.00
13.50
14.00
14.50
15.00
11.20
11.38
13.08
12.91
13.29
14.49
14.65

FIG. 10B

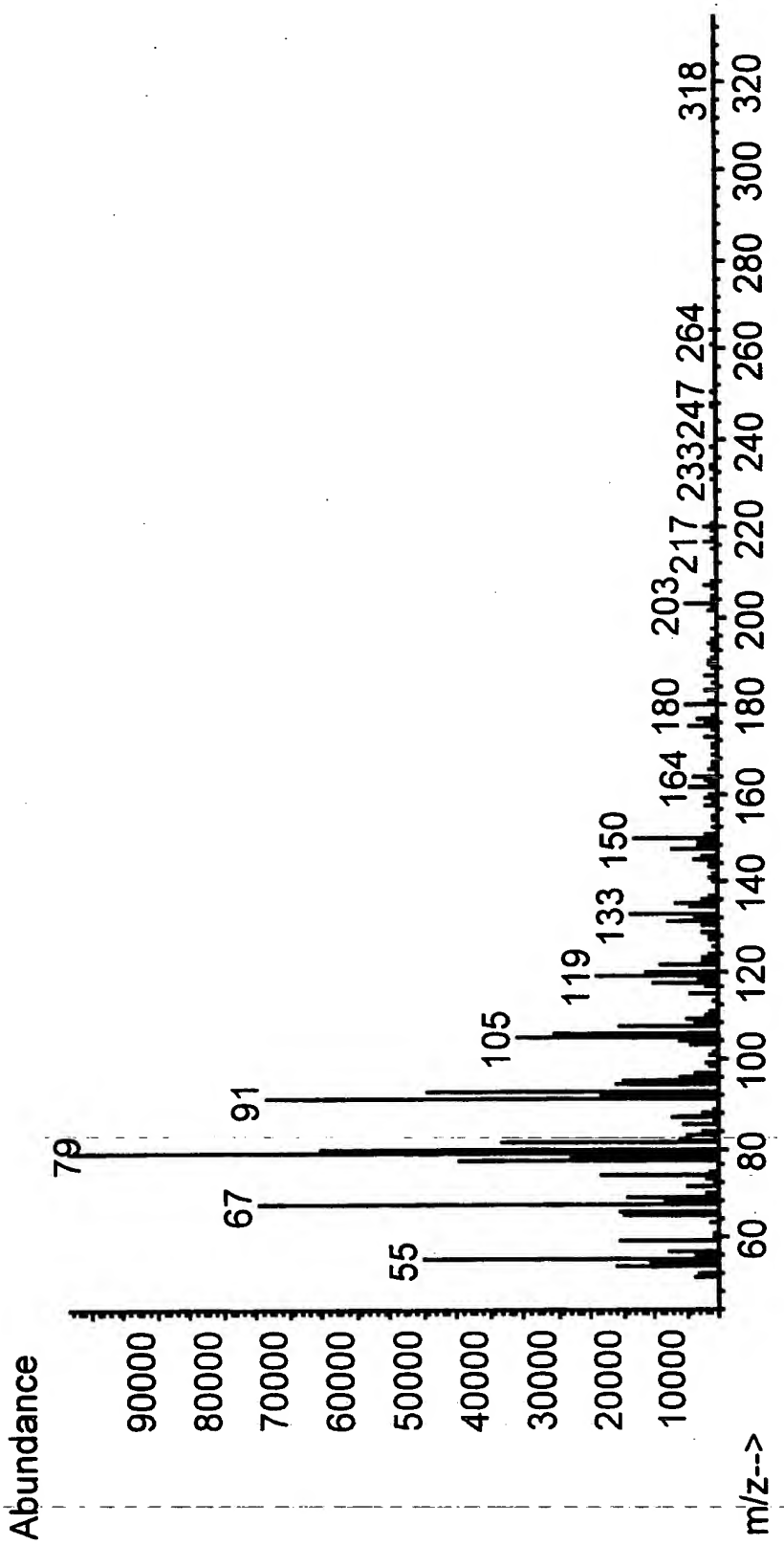

Abundance
90000
80000
70000
60000
50000
40000
30000
20000
10000
m/z-->
60
80
100
120
140
160
180
200
220
240
260
280
300
320
79
91
67
55
105
119
133
150
164
180
203
217
233
247
264
318

FIG. 10C

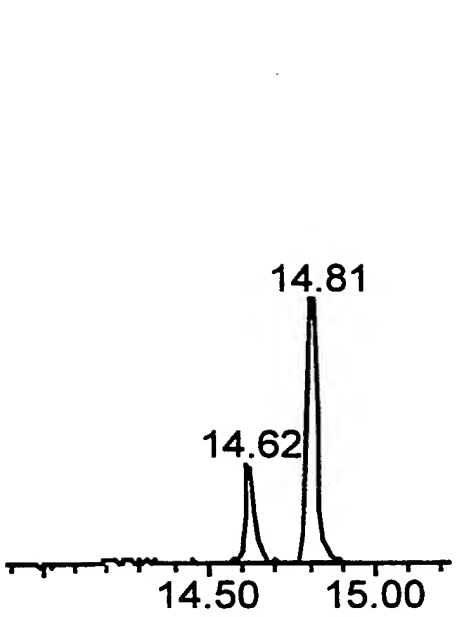


FIG. 11A

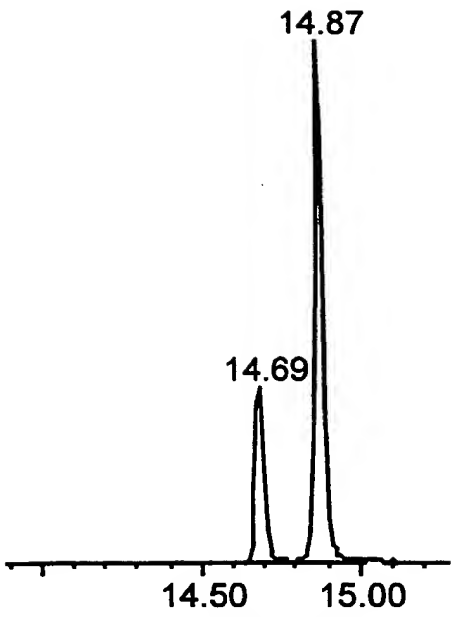


FIG. 11B

FAT-3 (Δ^6-desaturase)		FAT-4 (Δ^5-desaturase)	
substrate	% of substrate converted	substrate	% of substrate converted
18:1Δ^9	0	18:1$\Delta^?$	5
18:2$\Delta^{9,12}$	14	18:2$\Delta^{9,12}$	0
18:3 $\Delta^{9,12,15}$	17	18:3 $\Delta^{9,12,15}$	0
20:1Δ^{11}	0	20:1Δ^{11}	0
20:2$\Delta^{11,14}$	0	20:2$\Delta^{11,14}$	27
20:3$\Delta^{11,14,17}$	0	20:3$\Delta^{11,14,17}$	26
20:3$\Delta^{8,11,14}$	0	20:3$\Delta^{8,11,14}$	55

FIG. 12

	pYES		pYES-541	
	incorporation	desaturation	incorporation	desaturation
Δ^8 Substrates				
20:3 (11,14,17)	45.9	0	38.4	27.2
20:2 (11,14)	16.7	0	21.3	14.8
20:1 (11)	15.5	0	18.8	6.1
Δ^6 Substrates				
18:3 (9,12,15)	20.9	0	19.2	0
18:2 (9,12)	15.8	0	18.5	0
Δ^5 Substrate				
20:3 (8,11,14)	34.4	0	35.6	0

FIG. 13